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ORIGINAL ARTICLE

Evaluation of Extended Thoracoscopic Sympathectomy in the Treatment of Primary Palmar Hyperhidrosis

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Abstract

Background: ***Management of palmar and axillary hyperhidrosis is contingent upon the sympathetic denervation of the specific area afflicted, typically corresponding to the innervation provided by thoracic sympathetic ganglia numbers 2, 3, and 4.***

Aim and objectives: ***Assessment of extended thoracoscopic sympathectomy (T2, T3, T4) In the management of primary palmar hyperhidrosis as regards the advantage of decreasing compensatory hyperhidrosis and complications of sympathectomy,***

Subjects and methods: ***A prospective randomized study was undertaken on a cohort of 30 patients diagnosed with primary palmar hyperhidrosis. The patients were treated using a thoracoscopic method at Al-Azhar University Hospitals-Cairo, specifically at the Department of Vascular Surgery, throughout the period from October 2022 to October 2023.***

Results: ***The mean age was 20 ± 4.8. Sixteen patients were males. Fourteen patients were females—no significant difference between groups regarding complications. Three patients had compensatory hyperhidrosis, one patient had chest tube insertion, one patient had Pneumothorax, three patients had Intercostal neuralgia, seven patients had chest pain, and six patients showed Palmar over dryness. No patients showed Horner syndrome, intraoperative bleeding, postoperative wound infection, or mortality. There was a significant correlation between satisfaction rate and sex, the Presence of compensatory hyperhidrosis, Palmar over dryness and recurrence rate.,***

Conclusion: ***Extended thoracic sympathectomy has been found to be a safe and productive approach for the treatment of primary palmar hyperhidrosis. The treatment demonstrates efficacy in terms of treatment outcomes, the frequency of compensatory sweating, and recurrence while also exhibiting a reduced occurrence of side effects.***

Keywords: Extended Thoracoscopic Sympathectomy; Primary Palmar Hyperhidrosis; Pneumothorax

1. Introduction

Hyperhidrosis is a pathological condition that manifests as an excessive production of sweat beyond what is necessary for the body to regulate its temperature effectively. This condition can be categorized into primary and secondary forms.[1]

Primary hyperhidrosis is believed to be caused by a malfunction in the thermoregulation capacity of the sympathetic division of the autonomic nervous system. This condition is characterized by a significant imbalance between the stimulus, such as stress or high ambient temperatures, and the body's response, which manifests as excessive sweating. Upon stimulation, the process of excessive sweat production is promptly initiated and persists in a manner akin to a "short-circuit," irrespective of the duration or cessation of the stimulus. On certain occasions, there may be instances of hyperhidrosis manifesting without a discernible precipitating factor.[1]

Primary hyperhidrosis commonly manifests as excessive sweating in several locations of the body, including the palms, axilla, plantar, and facial regions. However, it is important to note that this condition can also manifest in any other region of the body.[2]

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The symptoms often exhibit bilateral and symmetrical characteristics and are not accompanied by any other connected disorders. The palms exhibit characteristics of being cool to the touch, moist, and displaying a color spectrum that spans from light to bluish hues. The occurrence of perspiration has an abrupt commencement, whether or not it is associated with mental stress-inducing circumstances.[3]

The management of palmar, axillary, and face hyperhidrosis is contingent upon the sympathetic denervation of the specific anatomical region involved, typically corresponding to the innervation provided by thoracic sympathetic ganglia 2, 3, and 4.[4]

Thoracoscopic sympathectomy is a surgery that is generally well-tolerated and has a low incidence of complications. Potential intraoperative problems that may arise during surgical procedures include lung injury, pneumothorax, significant hemorrhage, chylothorax, and phrenic nerve injury. All of these conditions are considered to be infrequent occurrences and can be mitigated by the implementation of a meticulous surgical approach. There exists a remote possibility of early postoperative pneumothorax, pleural effusion, and Horner's syndrome. However, the likelihood of these occurrences is minimal. Bradycardia may manifest, and when it does, it typically presents as asymptomatic and clinically inconsequential in the vast majority of people. Nevertheless, it is imperative to caution high-performance professional athletes regarding the potential impact on their physical capabilities and advise them of this risk prior to undergoing surgery.[1]

The objective of this study was to evaluate the efficacy of extended thoracoscopic sympathectomy, specifically targeting Thoracic sympathetic ganglion number 2 (T2), Thoracic sympathetic ganglion number 3 (T3), and Thoracic sympathetic ganglion number 4 (T4), in the management of primary palmar hyperhidrosis. The primary focus was to investigate the potential benefits of this surgical intervention in reducing compensatory hyperhidrosis and assessing the associated complications of sympathectomy.

2. Patients and methods

The present investigation was carried out at the Department of Vascular Surgery in Al-Azhar University Hospitals-Cairo, namely at AL Hussein and Sayed-Galal Hospitals. It was designed as a prospective randomized study. The research encompassed a cohort of 30 individuals diagnosed with primary palmar hyperhidrosis, who were treated using a thoracoscopic method involving the transection of the second, third, and fourth sympathetic chain ganglia. The procedures were performed under general anesthesia, with an average duration of one hour, spanning from October 2022 to October 2023.

Inclusion criteria: The study includes individuals of both male and female genders, aged between 16 and 45 years, who are diagnosed with primary palmar hyperhidrosis, with or without axillary involvement.

Exclusion criteria: Patients above 45 years, Patients below 16 years, Patients unfit for surgery, Patients suffering from primary craniofacial and LL (planter) hyperhidrosis

, Recurrent primary palmar hyperhidrosis, Patients who have secondary hyperhidrosis, Pleural or lung disorder, pregnant women and previous thoracotomy.

Method

Patient evaluation: All patients under study underwent history taking, complete physical examination, and routine laboratory investigations.

Procedures: The skin was prepared by showering at the night of the operation using an antiseptic solution after shaving axillary and thoracic hair if found. A prophylactic antibiotic was given as a premedication.

Equipment used: Video-endoscopic monitoring system, Optical telescope; 10 mm, 30 degrees, Surgical Monitor, Video-recorder, Three Trocars of sizes (5mm, 10mm, 10mm), Hook cautery (5mm size), Maryland Grasper (5mm size), Endoscopic scissors (5mm size), Endoscopic aspirator and Suction catheters. All open surgical equipment should be kept ready for any emergencies (Finochietto rib retractor, Allisson's lung retractor, Artery forceps, and Lung graspers).

Steps: The patient underwent the insertion of a Double Lumen Endotracheal Tube while under general anesthesia. The patient was positioned in a supine posture with a pad placed under the shoulder on the side that was operated on initially. The surgical table was inclined at an angle of 30° in the opposite direction, while the ventilation on the surgical side was obstructed, resulting in single lung ventilation. Entry into the pleural cavity was achieved by means of a 1-cm incision made in the anterior axillary line, namely in either the fourth or fifth intercostal gap. Carbon dioxide was introduced into the system at a pressure of up to 8 mmHg and a volume ranging from 1 to 2 L. Following the dissection of the muscles and parietal pleura using a curved clamp, a hard trocar of 10 mm in diameter was introduced into the surgical site to serve as a port for the camera. A second incision, measuring approximately 2 cm, was performed along the mid-axillary line of the fourth intercostal gap, posterior to the trajectory of the pectoralis major fibers (see Figure 1). Following the invention of the thoracoscope, it became feasible to readily identify the sympathetic chain

located beneath the pleura and intersecting perpendicularly with the head of the ribs. The ribs were utilized as reference points for identifying the specific levels at which to perform work. During the procedure, the costal pleura was incised using diathermy to expose the major sympathetic trunk. The sympathetic chain was dissected using diathermy at the superior border of the second, third, and fourth ribs. The procedure involved the utilization of a Maryland grasper to carefully grasp and separate the sympathetic chain and ganglia from their surrounding tissue. Subsequently, a portion of the sympathetic chain was excised at three specific levels (R2 – 2nd rib, R3 – 3rd rib, R4 – 4th rib) using an endoscopic hook. Cauterization was performed along the upper border of the second, third, and fourth ribs, encompassing the nerve of Kuntz, over a lateral distance of 3-4 cm (see Figure 2). Upon severing the link, the bed maintained hemostasis and underwent a meticulous examination to detect any signs of hemorrhaging. Subsequently, all instruments were extracted, and the incisions were subsequently sutured. They were shifting to the opposite side. The process of extubation and anesthetic recovery was conducted subsequent to the assessment of air entry.

Figure 1. Bi-portal VATS

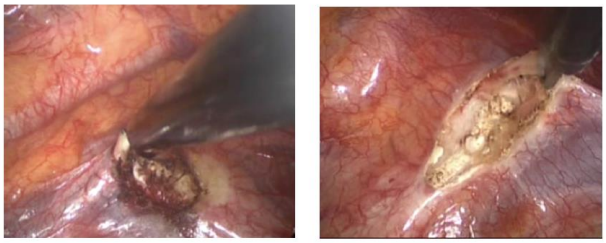

Figure 2. Cutting of thoracic sympathetic chain

Follow-up of patients: The patients were assessed and monitored promptly on the first day following the treatment and subsequently at one week, one month, three months, and six months in order to evaluate the effectiveness of the procedure and identify any potential complications.

Statistics: The data pertaining to age, gender, and unilateral or bilateral hyperhidrosis were obtained using manual means and subsequently entered into a computer for statistical analysis using the Statistical Package for the Social Sciences (SPSS). The software version 22 of SPSS Inc., based in Chicago, IL, USA, was utilized in the study. The quantitative data were reported in the format of mean ± standard deviation (SD). The qualitative data were given in the form of events and percentages. The confidence level for all coefficient intervals was established at 95%. The level of significance was determined by assessing the P value: If the P value is greater than 0.05, it is considered not statistically significant; if the P value is less than 0.05, it is considered statistically significant.

Ethical approval: The Ethical Committee of the Faculty of Medicine at Al-Azher University approved the operation. Prior to the operation, each patient provided written consent after receiving a comprehensive explanation of all pertinent data, including the procedure, potential benefits, foreseeable intraoperative and postoperative risks, reasonable expectations, and the potential occurrence of further issues.

3. Results

Table 1. Demographic data

AGE (MEAN±SD)	20 ± 4.8	
GENDER N (%)	Male	16 (53.3%)
	Female	14 (46.6)
BMI (MEAN±SD)	25 ± 2.1	
SMOKERS N (%)	10 (33.3%)	

The Mean age was 20 ± 4.8. 16 patients were males, 14 patients were females. Mean BMI was 25 ± 2.1 and 10 patients were smokers.

Table 2. Primary symptoms

PRIMARY SYMPTOMS	**N**	**%**
PALMER	30	100
PALMER AND AXILLARY	20	66.6

This table showed that. 30 patients had palmer hyperhidrosis and 20 patients had palmer and axillary hyperhidrosis.

Table 3. outcomes

HOSPITAL STAY (MEAN±SD)	1.03±0.3
SATISFACTION N (%)	
POOR	3 (10%)
GOOD	27 (90%)
DRYNESS OF THE HAND WITHIN 24 HOURS (MEAN±SD)	25 (83.33%)
DRYNESS OF THE COMBINED HAND AND AXILLA (MEAN±SD)	21 (70%)
DRYNESS OF THE HAND WITHIN 1 WEEK (MEAN±SD)	28 (93.33)

The presented table indicates that the average duration of hospitalization was 1.03±0.3. Furthermore, it was observed that a total of 27 patients reported a high level of satisfaction. A

total of 25 patients had symptoms of hand dryness within a 24-hour period. A total of 21 patients had xerosis in both the hand and axilla regions, while 28 patients experienced xerosis just in the hand region within a one-week timeframe.

Table 4. Complications

	N	%
COMPENSATORY HYPERHIDROSIS	3	10
CHEST TUBE	1	3.3
PNEUMOTHORAX	1	3.3
INTRAOPERATIVE BLEEDING	0	0
INTERCOSTAL NEURALGIA	3	10
PLEURITIC CHEST PAIN	7	23.3
MORTALITY	0	0
POST-OPERATIVE WOUND INFECTION	0	0
PALMAR OVER DRYNESS	6	20
HORNER SYNDROME	0	0

This table showed that 3 patients had Compensatory hyperhidrosis, 1 patient had chest tube insertion,1 patient had Pneumothorax, 3 patients had Intercostal neuralgia,7 patients had chest pain, 6 patients showed Palmar over dryness and no patients showed Horner syndrome, intraoperative bleeding, post-operative wound infection, or mortality.

Table 5. Recurrence rate

	N	%
RECURRENCE AFTER 1MONTH	0	0
RECURRENCE AFTER 3 MONTHS	1	3.3
RECURRENCE AFTER 6 MONTHS	1	3.3

This table showed that 1 patient showed recurrence after 3 and 6 months.

Table 6. Correlation between satisfaction and other parameters.

CORRELATIONS

		Successful induction
AGE	r	0.195
	P	0.1
GENDER	r	0.498*
	P	0.02
BMI	r	0.12
	P	0.61
PRESENCE OF COMPENSATORY HYPERHIDROSIS	r	-0.670**
	P	<0.0001
PALMAR OVER DRYNESS	R	-0.560**
	P	<0.0001
RECURRENCE	R	-0.495*
	P	0.01

P value< 0.05 is significant; P value< 0.01 is highly significant,

This table showed that there was significant correlation between satisfaction rate and sex, Presence of compensatory hyperhidrosis, Palmar over dryness and recurrence rate.

4. Discussion

In the present study, the demographic features of the participants were examined. The mean age of the patients was found to be 20 ± 4.8 years. Out of the total sample size, 16 individuals (53.3%) were identified as males, while 14 individuals (46.6%) were identified as females. The average body mass index (BMI) was 25 ± 2.1 kg/m2. Among the participants, 33.3% were smokers, 66.6% had a family history of hyperhidrosis, and 23.3% had received prior treatment.

In conjunction with our investigation, a separate study conducted by Salim et al. examined the effects of thoracoscopic T2 sympathectomy on individuals diagnosed with primary palmar hyperhidrosis. A prospective randomized trial was conducted, enrolling a total of 120 patients who were diagnosed with primary palmar and axillary hyperhidrosis. The patients had a mean age of 21.40 ± 3.54 years. The study had a follow-up period of 1 year. The sample consisted of 64 male participants and 55 female participants. A total of 64 cases, accounting for 53.3% of the sample, exhibited a positive family history.[5]

In relation to the principal symptoms, all 30 patients (100%) exhibited palmar hyperhidrosis. Out of the total sample size, 20 individuals, accounting for 66.6% of the cohort, had symptoms of axillary hyperhidrosis.

In a separate investigation conducted by Huang et al., the predominant symptoms seen among patients included hyperhidrosis in the palms, axillae, and plantar regions. In certain instances of heightened severity, patients may exhibit erythema of the hands and profuse perspiration. [6]

The study conducted by Askari et al. documented the prevalence of Primary Hyperhidrosis (PH) in several regions of the body. The results indicated that PH was most commonly observed in the palms (46.5%), followed by the face (26.8%), the axilla (25.4%), and the feet (1.4%).[7]

Regarding the results, the mean hospital stay was found to be 1.03±0.3. A total of 27 patients, accounting for 90% of the sample, reported experiencing good satisfaction. A total of 25 patients, accounting for 83.33% of the sample, exhibited symptoms of hand dryness during 24 hours. Dryness of the combined hand and axilla was observed in 21 out of 30 individuals, accounting for 70% of the sample. A total of 28 patients, accounting for 93.33% of the sample, exhibited symptoms of hand dryness within one week.

In addition to the discoveries mentioned above by Lin et al., it was revealed that the duration of hospitalization was brief, as 114 patients (96.6%) were discharged on the initial day following the surgical procedure, while the remaining patients were discharged on the subsequent day.[8]

In contrast, our findings diverge from other studies conducted by Rodríguez et al. (2008) and Leseche et al., which documented a decline in patient satisfaction over time.[9]

In the current study, complications data showed that 3 patients had Compensatory hyperhidrosis,1 patient had chest tube insertion, 1 patient had Pneumothorax, 3 patients had Intercostal neuralgia, 7 patients had chest pain, 6 patients showed Palmar over dryness, and no patients showed mortality, Horner syndrome, Postoperative wound infection, or intraoperative bleeding. Also, Salim et al. showed that 27 patients had Compensatory sweating, 28 patients had Pneumothorax, 5 patients had Intercostal neuralgia, 9 patients had Overhands, 1 had Hemothorax, and no patient had Horner syndrome. [5]

Contrary to the user's assertion, In their study, Gunal et al. (year) found no instances of postoperative sequelae, including ptosis, wound infection, or hemothorax, in any of the patients. A residual pneumothorax was observed in a single patient, necessitating the implementation of thoracic drainage. The patient in question experienced a prolonged air leak, perhaps resulting from intraoperative lung damage, which subsequently prolonged their hospital release.[10]

Regarding the recurrence rate, our study revealed that only one patient experienced recurrence after 3 months, while another patient experienced recurrence after 6 months.

In a separate recent study conducted by Elshahawy et al. Out of the patient cohort, only two individuals experienced a recurrence of symptoms. One patient belonging to the cautery group exhibited a recurrence at the axillary region. This particular case was successfully addressed through a redo sympathectomy procedure at the R4 level, resulting in complete resolution of symptoms postoperatively. The second patient, who was part of the clipping group, presented a recurrence at the palmer region on the right side. Similar to the previous case, this patient underwent a redo sympathectomy at the R3 level, leading to the complete resolution of symptoms after the surgery. Both patients were treated following the original procedure.[11]

The current investigation shows a noteworthy association between satisfaction rate and variables such as sex, presence of compensatory hyperhidrosis, palmar excessive dryness, and recurrence rate.

Liu et al. proposed an association between the presence of abnormally dry hands, namely palmar over dryness, and a decreased level of patient satisfaction.[12]

However, Ong et al. (year) did not find a statistically significant link between dry hands and the level of satisfaction in their study. This lack of significance may be attributed to the small sample size utilized. Nevertheless, it is crucial to take this potential side effect into account when providing counseling to patients regarding the procedure.[13]

5. *Conclusion*

In summary, prolonged thoracic sympathectomy has been demonstrated to be a secure and productive approach in the management of primary palmar hyperhidrosis. The treatment demonstrates efficacy in relation to its outcomes, incidence of compensatory sweating, recurrence rates, and a reduced occurrence of adverse effects. Additional research is necessary to provide more support for the current findings, which may involve larger patient cohorts and longer periods of follow-up.

Disclosure

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